FLIGHT SUMMARY REPORT

Flight Number: 99-126

Calendar/Julian Date: 14 September 1999 • 257

Sensor Package: Wild Heerbrugg RC-10
Airborne Visible and Infrared
Imaging Spectrometer (AVIRIS)
Thematic Mapper Simulator (TMS)

Area(s) Covered: Northern Central Valley, California

Investigator(s): Posley, State of California,
Farmland Mapping Program

Aircraft #: 809

SENSOR DATA

Accession #:	05390	05391	-----	-----
Sensor ID #:	035	034	074	099
Sensor Type:	RC-10	RC-10	TMS	AVIRIS
Focal Length:	6” 153.46mm	12” 304.66mm	-----	-----
Film Type:	Aerochrome IR SO-134	Aerochrome IR SO-134	-----	-----
Filtration:	Wratten 12+2.2AV	Wratten 12	-----	-----
Spectral Band:	510-900nm	510-900nm	-----	-----
f Stop:	8	11	-----	-----
Shutter Speed:	1/275	1/300	-----	-----
# of Frames:	198	43	-----	-----
% Overlap:	60	60	-----	-----
Quality:	Good	Good	Excellent	-----
Remarks:	Add 14 seconds for correct UTC	Add 17 seconds for correct UTC		

Airborne Science Program

The Airborne Science Program at NASA's Dryden Flight Research Center, Edwards, California, operates two ER-2 high altitude aircraft in support of NASA earth science research. The ER-2s are used as readily deployable high altitude sensor platforms to collect remote sensing and in situ data on earth resources, celestial phenomena, atmospheric dynamics, and oceanic processes. Additionally, these aircraft are used for electronic sensor research and development and satellite investigative support.

The ER-2s are flown from various deployment sites in support of scientific research sponsored by NASA and other federal, state, university, and industry investigators. Data are collected from deployment sites in Kansas, Texas, Virginia, Florida, and Alaska. Cooperative international scientific projects have deployed the aircraft to sites in Great Britain, Australia, Chile, and Norway.

Photographic and digital imaging sensors are flown aboard the ER-2s in support of research objectives defined by the sponsoring investigators. High resolution mapping cameras and digital multispectral imaging sensors are utilized in a variety of configurations in the ER-2s' four pressurized experiment compartments. The following provides a description of the digital multispectral sensor(s) and camera(s) used for data collection during this flight.

Airborne Visible and Infrared Imaging Spectrometer

The Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) is the second in the series of imaging spectrometer instruments developed at the Jet Propulsion Laboratory (JPL) for earth remote sensing. This instrument uses scanning optics and four spectrometers to image a 614-pixel swath simultaneously in 224 contiguous spectral bands (0.4-2.4 mm).

AVIRIS parameters are as follows:

IFOV:	1 mrad
Ground Resolution:	66 feet (20 meters) at 65,000 feet
Total Scan Angle:	30^{o}
Swath Width:	5.7 nmi (10.6 km) at 65,000 feet
Spectral Coverage:	0.41-2.45 _m
Pixels/Scan Line:	614
Number of Spectral Bands:	224
Digitization:	10-bits
Data Rate:	17 MBPS

Spectrometer	Wavelength Range	Number of Bands	Sampling Interval
1	0.41 - 0.70 _m	31	9.4 nm
2	0.68 - 1.27 _m	63	9.4 nm
3	1.25 - 1.86 _m	63	9.7 nm
4	1.84 - 2.45 _m	63	9.7 nm

All AVIRIS data is decommutated and archived at JPL and not currently available for public distribution. For further information contact Rob Green at Jet Propulsion Laboratory, 4800 Oak Grove Drive, Mail Stop 183-501, Pasadena, California 91109-8099.

Camera Systems

Various camera systems and films are used for photographic data collection. Film types include high definition color infrared, natural color, and black and white emulsions. Available photographic systems are as follows:

- Wild-Heerbrugg RC-10 metric mapping camera
  - 9 x 9 inch film format
  - 6 inch focal length lens provides area coverage of 16 x 16 nautical miles from 65,000 feet
  - 12 inch focal length lens provides area coverage of 8 x 8 nautical miles from 65,000 feet

- Hycon HR-732 large scale mapping camera
  - 9 x 18 inch film format
  - 24 inch focal length lens provides area coverage of 4 x 8 nautical miles from 65,000 feet

- IRIS II Panoramic camera
  - 4.5 x 34.7 inch film format
  - 24 inch focal length lens
  - 90 degree field of view provides area coverage of 2 x 21.4 nautical miles from 65,000 feet

Thematic Mapper Simulator

The Daedalus Thematic Mapper Simulator (TMS) is a multispectral scanner flown aboard the ER-2 aircraft which simulates spatial and spectral characteristics of the seven Landsat-D Thematic Mapper bands. The specific bands are as follows:

Daedalus Channel	TM Band	Wavelength, μm
1	A	0.42 - 0.45
2	1	0.45 - 0.52
3	2	0.52 - 0.60
4	B	0.60 - 0.62
5	3	0.63 - 0.69
6	C	0.69 - 0.75
7	4	0.76 - 0.90
8	D	0.91 - 1.05
9	5	1.55 - 1.75
10	7	2.08 - 2.35
11	6	8.5 - 14.0 low gain
12	6	8.5 - 14.0 high gain

Sensor/aircraft parameters are as follows:

IFOV:	1.25 mrad
Ground Resolution:	81 feet (25 meters) at 65,000 feet
Total Scan Angle:	43^{o}
Swath Width:	8.4 nmi (15.6 km) at 65,000 feet
Pixels/Scan Line:	716
Scan Rate:	12.5 scans/second
Ground Speed:	400 kts (206 m/second)

Data Availability

The U.S. Geological Survey's EROS Data Center at Sioux Falls, South Dakota serves as the archive and product distribution facility for Airborne Science Program aircraft acquired photographic and digital imagery. The photographic archive consists of photography acquired by the program from 1971 to April 1996. For information regarding photography and digital data (including areas of coverage, products, and product costs) contact EROS Data Center, Customer Services, Sioux Falls, South Dakota 57198 (Telephone: 605.594.6151).

As of April 1996 the EROS Data Center no longer receives an archive copy of newly acquired Airborne Science Program photography. Original photography is archived with the Airborne Sensor Facility at Ames Research Center. A user copy of the photography is provided to the principal investigators for each flight. Principal investigators are cited on the first page of their respective flight summary reports. For information regarding photography acquired from April 1996 to the present contact the Airborne Sensor Facility as follows:

Flight Documentation and Data Archive Searches

The following is the web site for flight documentation as published by the Airborne Sensor Facility at NASA Ames Research Center: http://asapdata.arc.nasa.gov/er-2fsr.html

Additional information regarding flight documentation to include data archive searches, data availability, sensor parameters, and areas of coverage may be obtained from the following:
Airborne Sensor Facility, MS 240-6, NASA Ames Research Center, Moffett Field, CA 94035-1000, Telephone: 650.604.6252 (FAX 650.604.4987).

CAMERA FLIGHT LINE DATA
FLIGHT NO. 99-126

Accession # 05390

Sensor # 035

Check Points	Frame Numbers	Time (GMT-hr, min, sec) START	Time (GMT-hr, min, sec) END	Altitude, MSL feet/meters	Cloud Cover/Remarks
A - C	9512-9528	18:07:15	18:20:21	66300/20208	Clear
D - E	9529-9534	18:25:50	18:30:05	65000/19812	Clear
H - I	9535-9538	18:37:57	18:40:16	65000/19812	Clear
K - L	9539-9549	18:48:54	18:57:44	65500/19965	10% cumulus (frames 9544-9547); 10% smoke (frames 9548-9549)
M - N	9550-9588	19:02:34	19:37:02	65500/19965	20-30% smoke and coastal stratus (frames 9550-9551); 10-30% coastal stratus (frames 9554-9558); thin haze (frames 9581-9584); 10% cumulus (frames 9586-9588)
Q - S	9589-9626	19:47:16	20:20:21	65500/19965	10% cumulus (frames 9619-9621); 10-20% coastal stratus (frames 9625-9626)
T - Y	9627-9665	20:33:55	21:08:05	65500/19965	20% coastal stratus (frame 9627); 10-40% coastal stratus (frames 9631-9638)
Z - 2	9666-9692	21:11:41	21:35:42	65500/19965	Smoke (frames 9667-9668); 10% coastal stratus (frame 9692)

CAMERA FLIGHT LINE DATA
FLIGHT NO. 99-126

Accession # 05390

Sensor # 035

Check Points	Frame Numbers	Time (GMT-hr, min, sec) START	Time (GMT-hr, min, sec) END	Altitude, MSL feet/meters	Cloud Cover/Remarks
3 - L	9693-9700	21:49:19	21:54:55	65500/19965	10% coastal stratus and haze (frames 9699-9700)
8 - 10	9701-9709	22:18:07	22:23:37	50500/15392	Clear

CAMERA FLIGHT LINE DATA
FLIGHT NO. 99-126

Accession # 05391

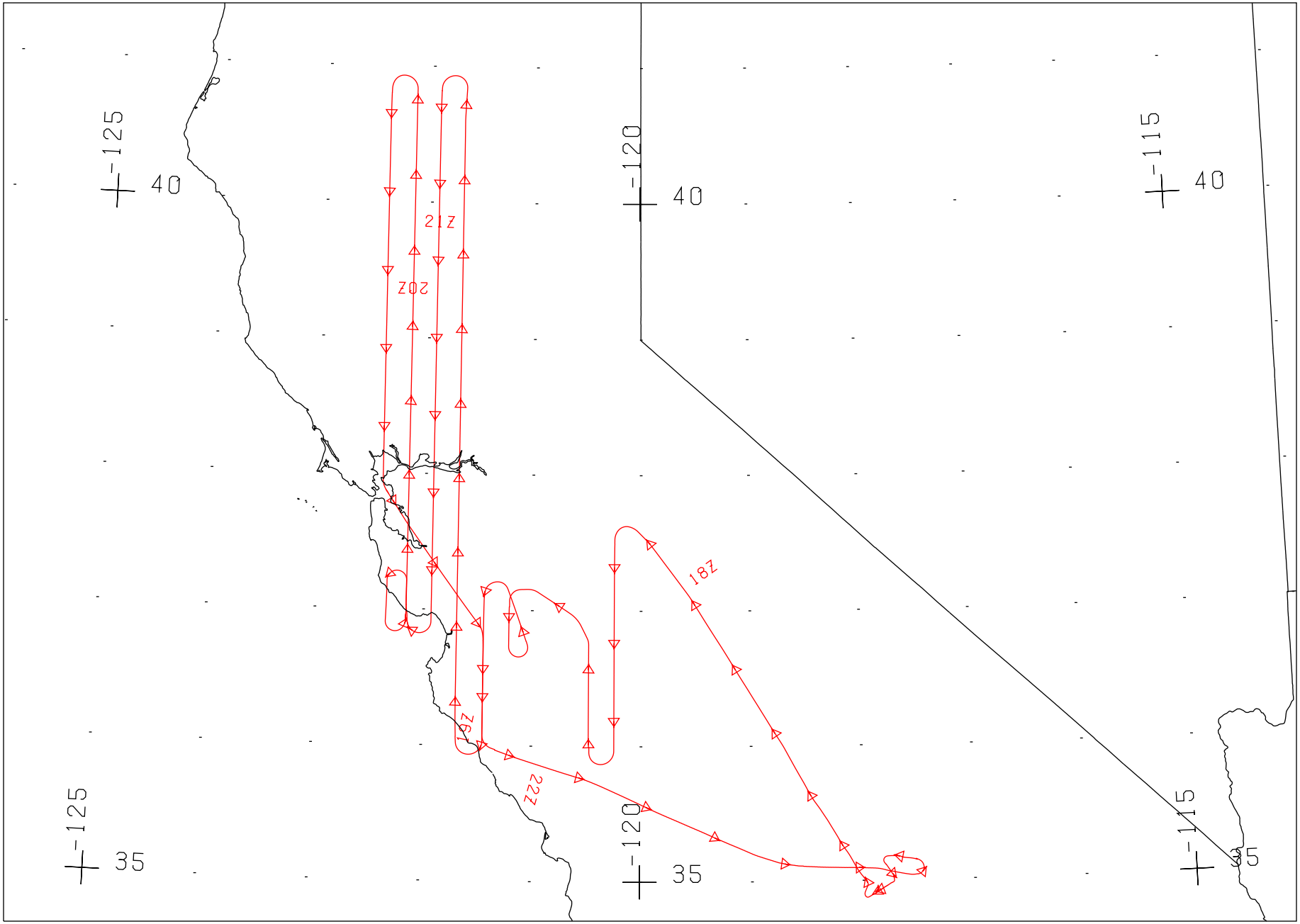
Sensor # 034

Check Points	Frame Numbers	Time (GMT-hr, min, sec) START	Time (GMT-hr, min, sec) END	Altitude, MSL feet/meters	Cloud Cover/Remarks
R - S	2913-2919	20:17:23	20:19:44	65500/19965	Clear
U - X	2920-2925	20:37:49	20:39:16	65500/19965	10-40% coastal stratus
1 - 2	2926-2940	21:29:53	21:35:53	65500/19965	10% coastal stratus (frames 2939-2940)
8 -10	2941-2955	21:18:05	22:23:43	50500/15392	Clear

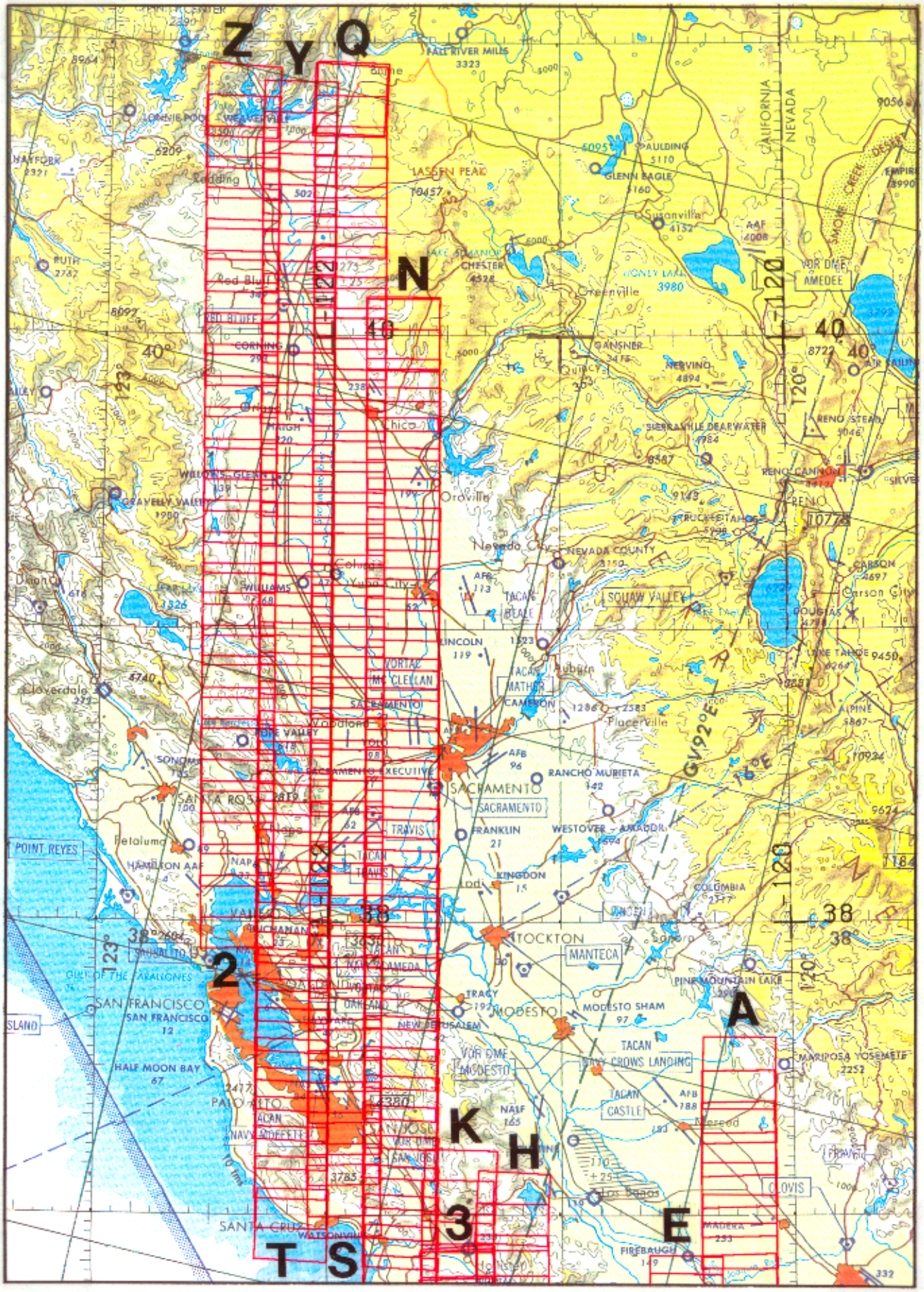
DAEDALUS FLIGHT DATA
FLIGHT NUMBER: 99-126

Check Points	Actual time (GMT) begin	Actual time (GMT) end	Actual scanline begin	Actual scanline end	Altitude feet/meter	ground speed knots/mps	Scan Speed (rps)	total Good scanlines	total Interpolated scanlines	total Repeated scanlines
B-C	18:11:07.0	18:20:39.0	1462	8609	65788/20052	423/212	12.50	7148	0	0
D-E	18:24:11.0	18:30:27.0	11259	15959	64912/19785	409/205	12.50	4701	0	0
F-G	18:33:15.0	18:35:27.0	18059	19709	65107/19845	411/206	12.50	1651	0	0
H-I	18:38:19.0	18:40:39.0	21859	23609	65034/19822	428/215	12.50	1751	0	0
J-H	18:43:19.0	18:46:43.0	25609	28159	64913/19785	410/206	12.50	2551	0	0
K-L	18:49:23.0	18:58:23.0	30159	36909	65440/19946	422/212	12.50	6751	0	0
M-O	19:01:27.0	19:42:27.0	39209	69959	65433/19944	411/206	12.50	30751	0	0
O-P	19:42:43.0	19:44:35.0	70159	71559	65136/19853	413/207	12.50	1401	0	0
Q-S	19:47:31.0	20:21:43.0	73759	99409	65159/19860	426/214	12.50	25651	0	0
T-U	20:25:23.0	20:26:47.0	102159	103209	65256/19890	409/205	12.50	1051	0	0
V-W	20:29:23.0	20:31:27.0	105159	106709	65041/19824	418/210	12.50	1551	0	0
T-Y	20:33:51.0	21:08:59.0	108509	134859	65621/20001	418/210	12.50	26351	0	0
Z-2	21:12:11.0	21:36:31.0	137259	155509	65386/19930	438/220	12.50	18251	0	0
2-X	21:37:42.0	21:39:46.0	156391	157941	65812/20059	418/210	12.50	1551	0	0
X-3	21:40:02.0	21:48:22.0	158141	164391	65826/20064	412/207	12.50	6251	0	0
3-L	21:49:26.0	21:55:34.0	165191	169791	65660/20013	409/205	12.50	4601	0	0
L-4	21:57:14.0	21:58:26.0	171041	171941	65111/19846	400/201	12.50	901	0	0
4-5	21:58:38.0	22:03:10.0	172091	175491	65124/19850	398/200	12.50	3401	0	0
5-6	22:04:32.0	22:14:00.0	176518	183618	62473/19042	399/200	12.50	7101	0	0
6-7	22:14:12.0	22:15:44.0	183768	184918	58152/17725	400/201	12.50	1151	0	0
7-8	22:16:20.0	22:17:32.0	185368	186268	55816/17013	402/202	12.50	901	0	0
8-9	22:19:08.0	22:21:56.0	187468	189568	50572/15414	403/202	12.50	2101	0	0
9-10	22:22:16.0	22:23:32.0	189818	190768	43502/13259	388/195	12.50	951	0	0

Note: Channel 8 geographically offset 1 sample from all other channels



FLIGHT 99-126 14 SEPTEMBER 1999 A/C 809 RC-10 (6") / TMS / RC-10 (12") / AVIRIS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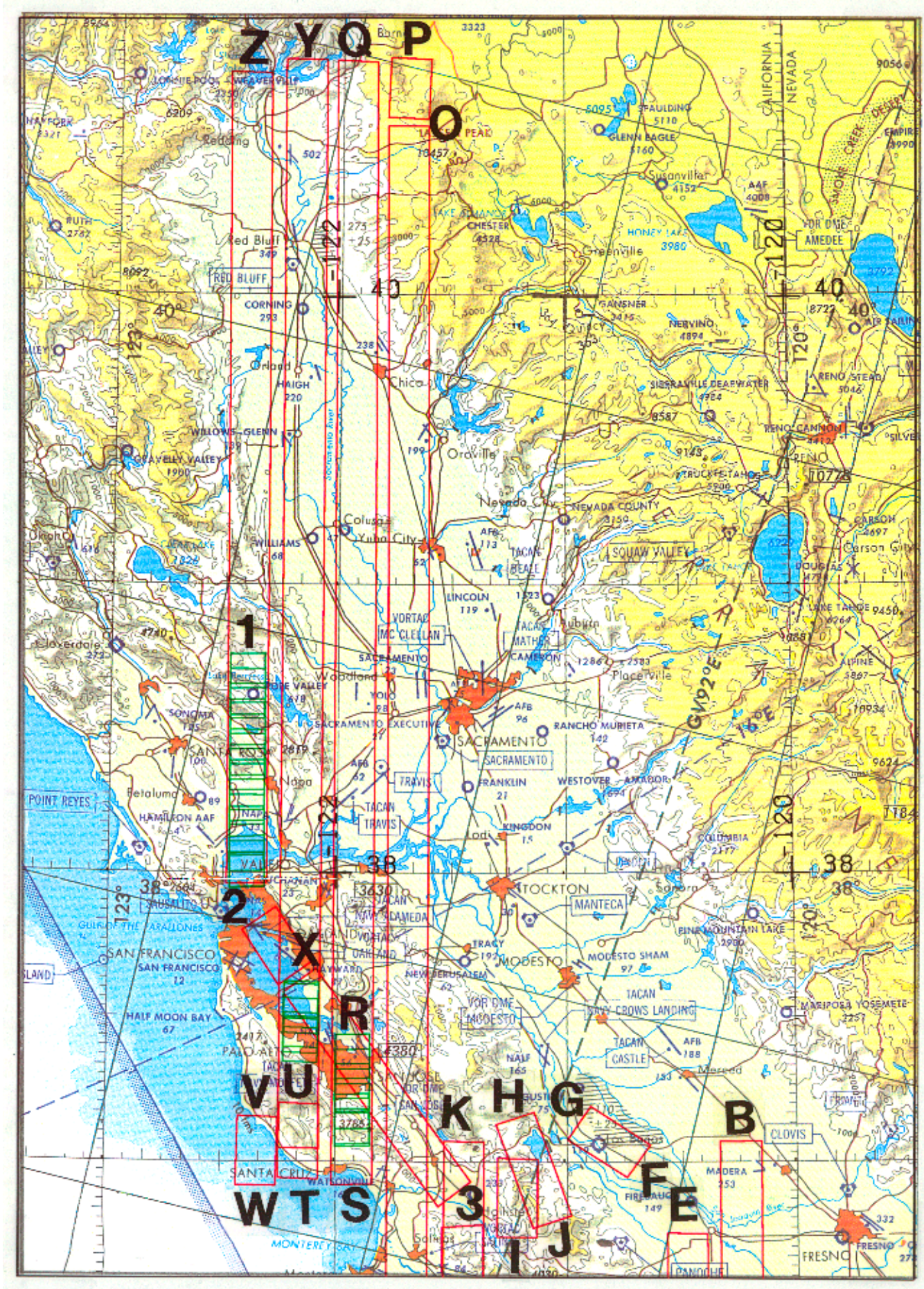
FLIGHT 99-126 14 SEPTEMBER 1999 A/C 809 RC-10 (6") JNC 43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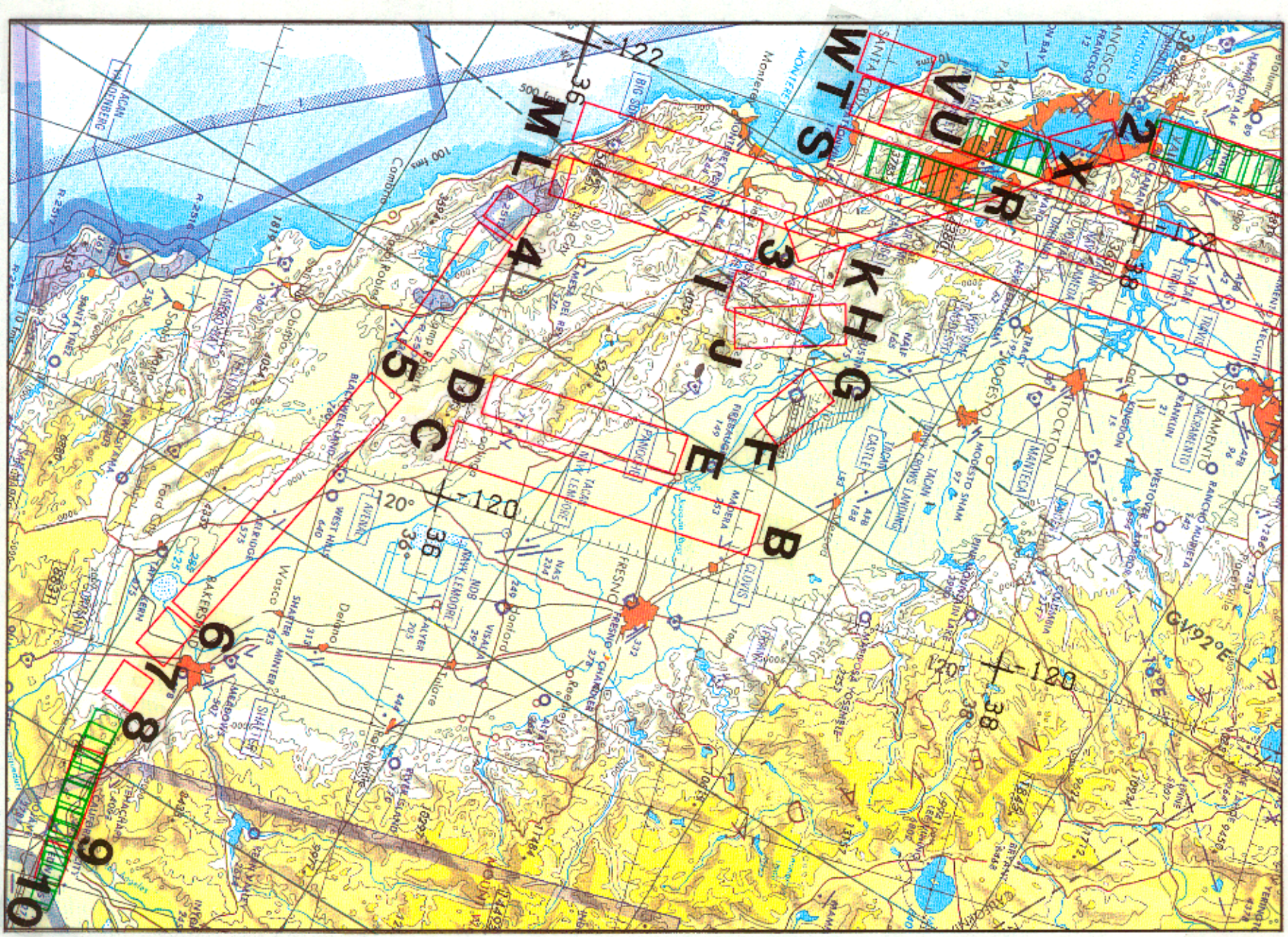
FLIGHT 99-126
14 SEPTEMBER 1999
A/C 809
RC-10 (6")
JNC 43



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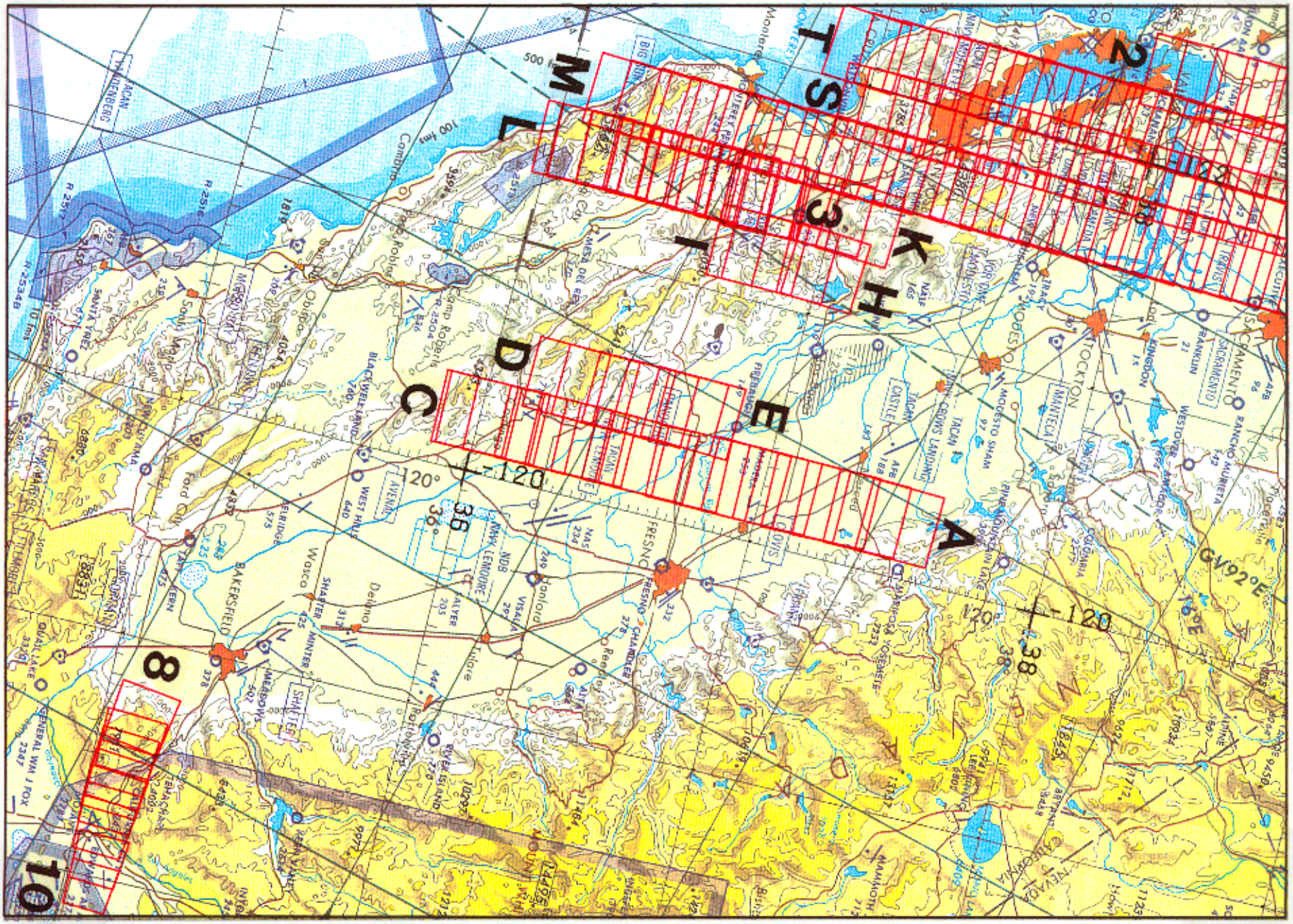

FLIGHT 99-126 14 SEPTEMBER 1999 A/C 809 RC-10 (6") JNC 43